

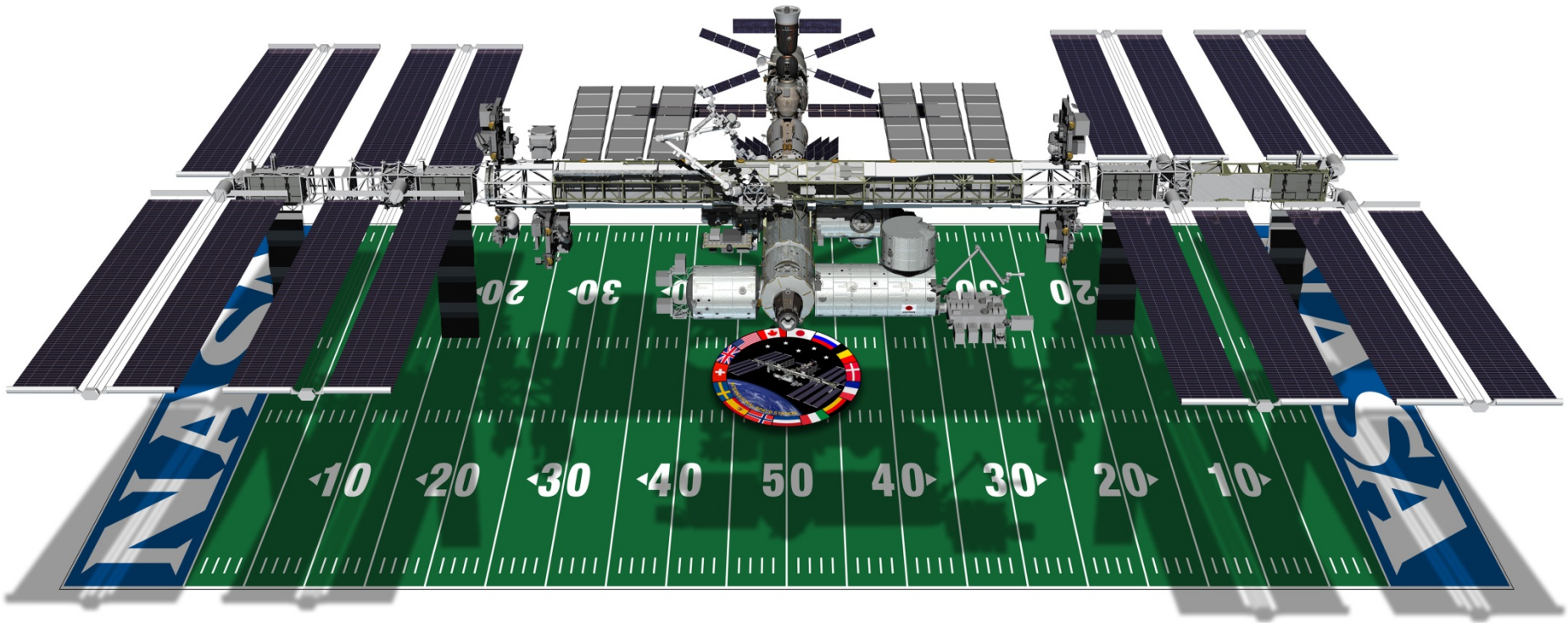


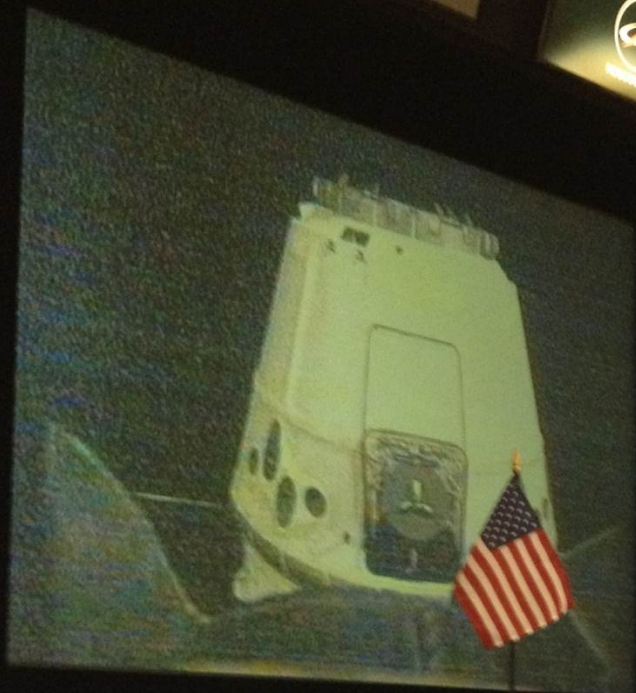
Inventive Tricks and Fixes Aboard the ISS

MacGyvering Station

International Space Station

National Aeronautics and Space Administration





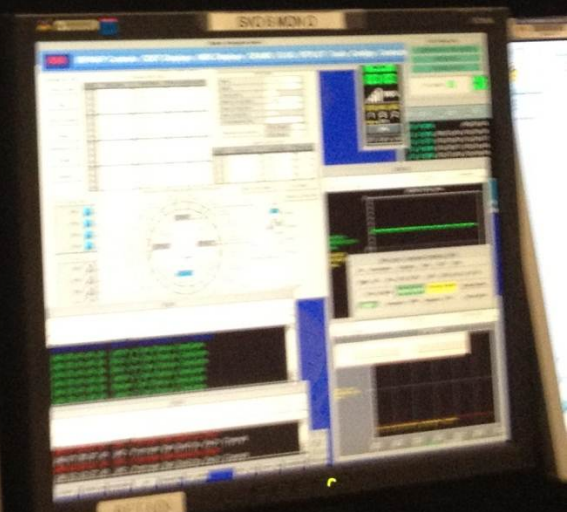
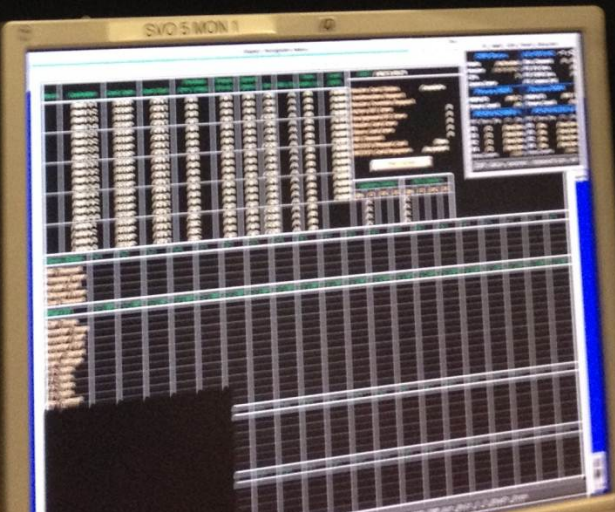
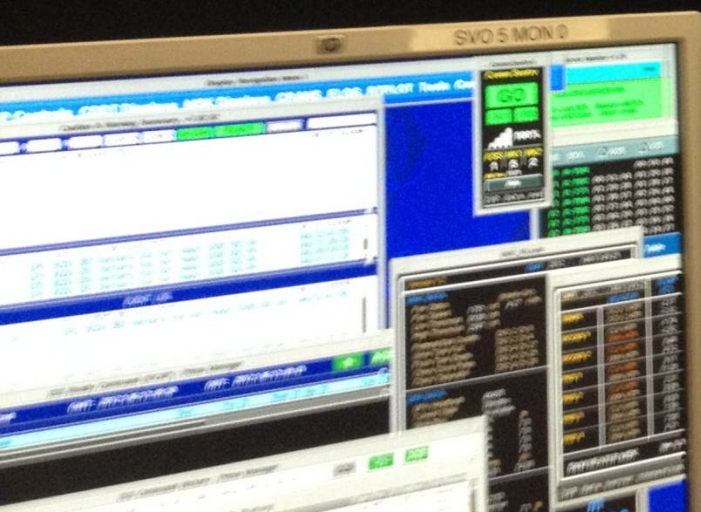
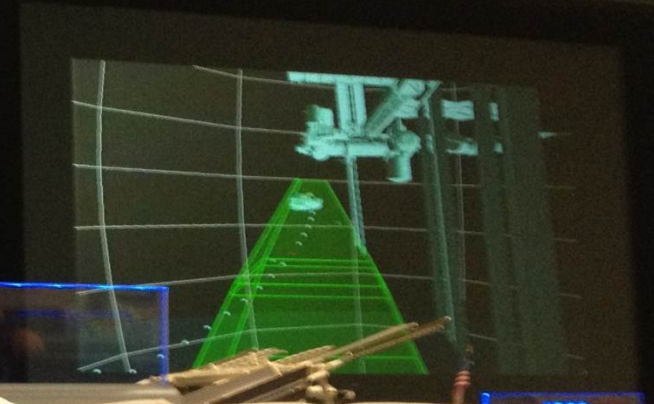
OUT
DRAGON NET
ORION NET (NEW)
CREW SLEEP



Mission Control Center



OSO





The Challenge



The Plan Never Survives...

- We've done a lot things that weren't planned to be done on board...
 - Upgrading computer processors
 - Removing a filter from a pump that didn't need one, and adding a filter to a different pump that needed one
 - Creating sleeping quarters until the real ones arrived
- But some fixes were more inventive than others...



ISS01E6264 2000/12/16 16:29:56



ISS01E6262 2000/12/16 16:18:30

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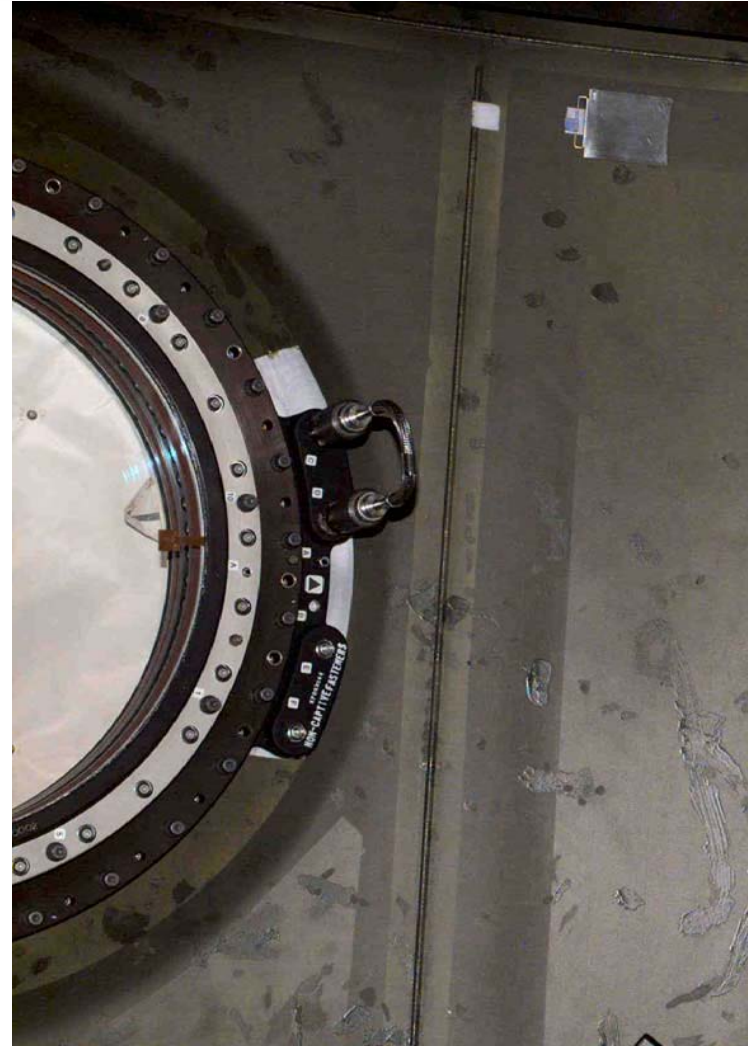
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Table, International Space Station (ISS)

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The Window Box (2004 / Inc 9)

- **Problem:** crew uses a hose to space as a handhold to look out the window.
- **Impact:** station leaks too much.
- **Workaround:** build a box around the hose.
Originally it was to be built from on-orbit supplies, but eventually a kit to build the box was flown.

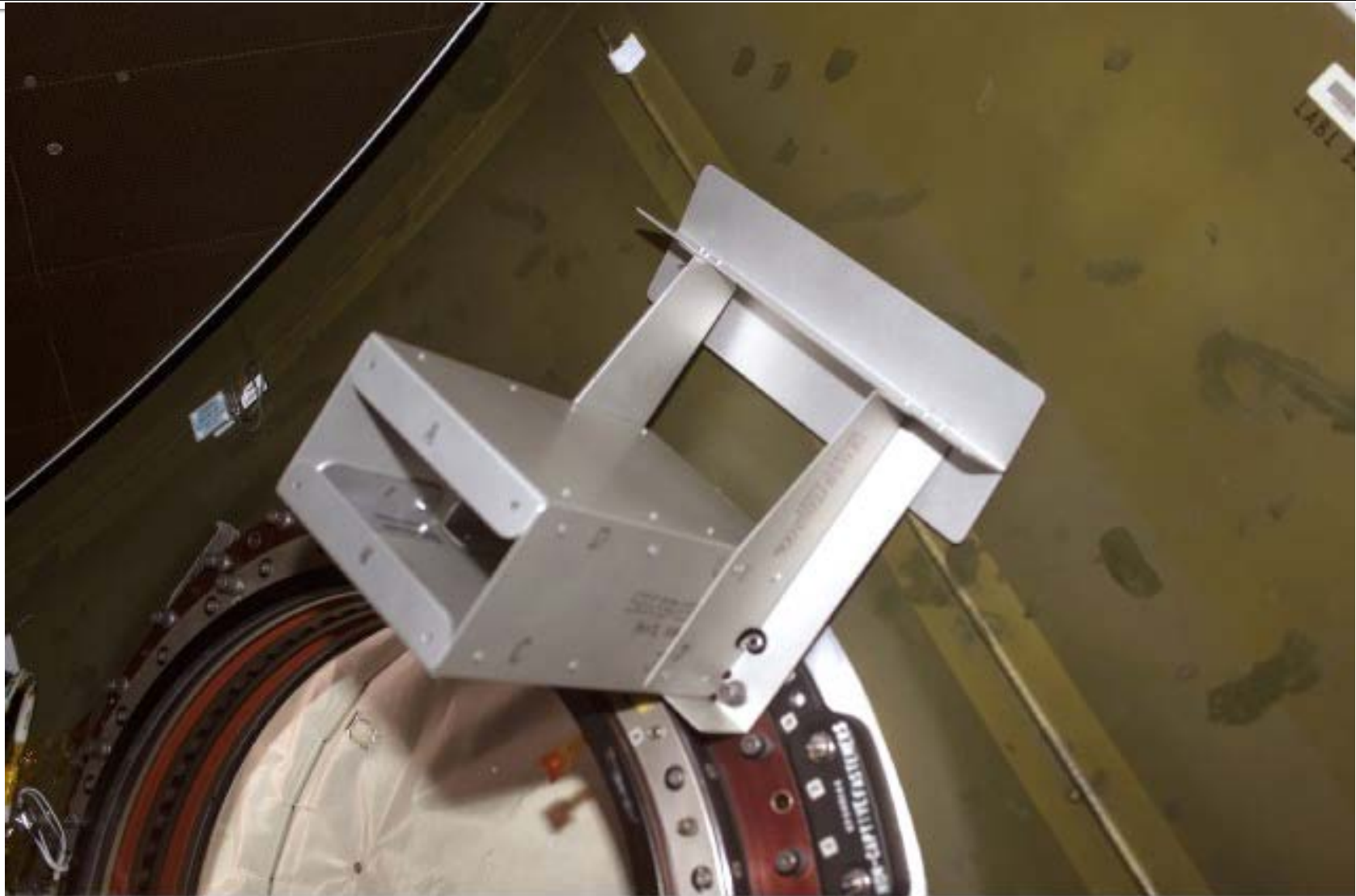


Window Box Parts List

Table 1 - Lab Window Flex Hose Cover Kit contents

Item #	Part Name	Quantity
1	Top Plate	1
2	Bottom Plate	1
3	Right Plate	1
4	Left Plate	1
5	Front Plate	1
6	Right Bracket	1
7	Left Bracket	1
8	Attachment Bracket, 74°	1
9	Attachment Bracket, 100°	1
10	Angle Bracket (M&C)	1
11	Angle Bracket (K&J)	1
12	Angle Bracket (L&R)	1
13	Angle Bracket (N&P)	1
14	Angle Bracket (E&D)	1
15	Angle Bracket (H&U)	1
16	Angle Bracket (F&O)	1
17	Angle Bracket (G&Q)	1
18	Velcro Loop, 11.0 x 1.0	2
19	1/8" Dia. Pop Rivet, 1/4" Length	60 rivets
20	Lab Window Bolt	2
21	Lab Window Washer	2
22	Keep Out Zone Decal	1

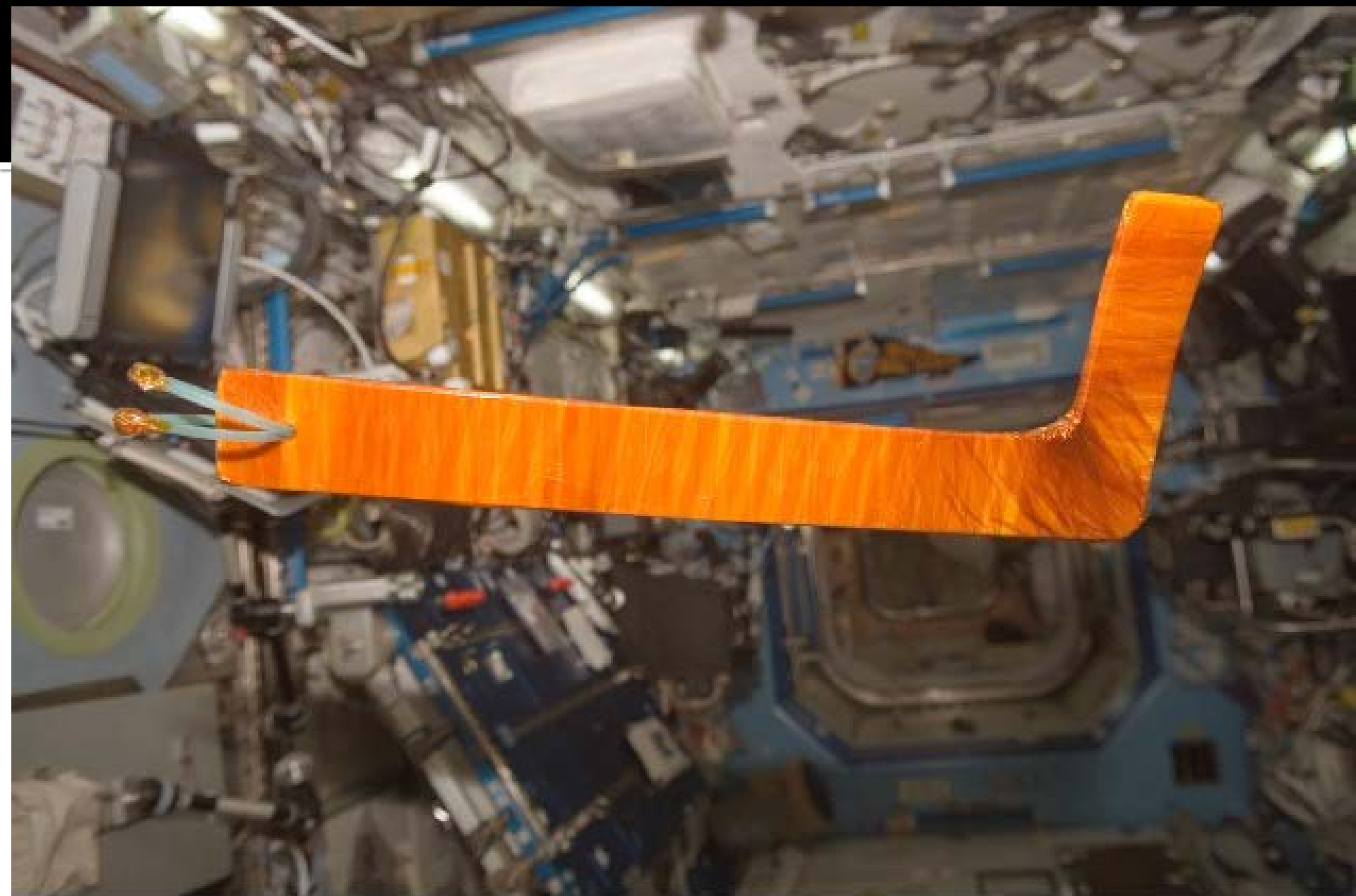
The Window Box



ISS009E17278

A Balky Tool: Percussive Maintenance





ISS015E08376

Solar Array Hockey Stick - In Use



Solar Array Cufflinks Parts List

■ MATERIALS:

- Sharpie
- Ziplock Bag (two)
- Kapton Tape
- EVA Tape
- ISS Pin Kit: (two)
- Page 3
 - 12 Ga Wire (50 feet) (need approximately 66 feet total)
- Clamp and Bracket Kit:
 - 0.03" x 4" x 12" Aluminum (two)
- Large Gauge Pin Kit:
 - Small Split Bolt Connector P/N S-4

■ TOOLS:

- Eye Protection
- DCS 760 Camera
- ISS Vacuum Cleaner
- MWA Utility Kit:
 - Track Restraint (two)
 - PC Circuit Board Clamp (two)
- Clamp and Bracket Kit:
 - Tin Snips
 - Hand Punch
 - Hand Punch Key

- 9/32" Punch Insert (engraved "281")
- 9/32" Punch Die (engraved "281")

■ ISS IVA Toolbox:

■ Drawer 2:

- 9/16" Socket, 3/8" Drive
- 11/16" Socket, 3/8" Drive
- Ratchet, 3/8" Drive
- (40-200 in-lbs) Trq Wrench, 3/8" Drive

■ Drawer 4:

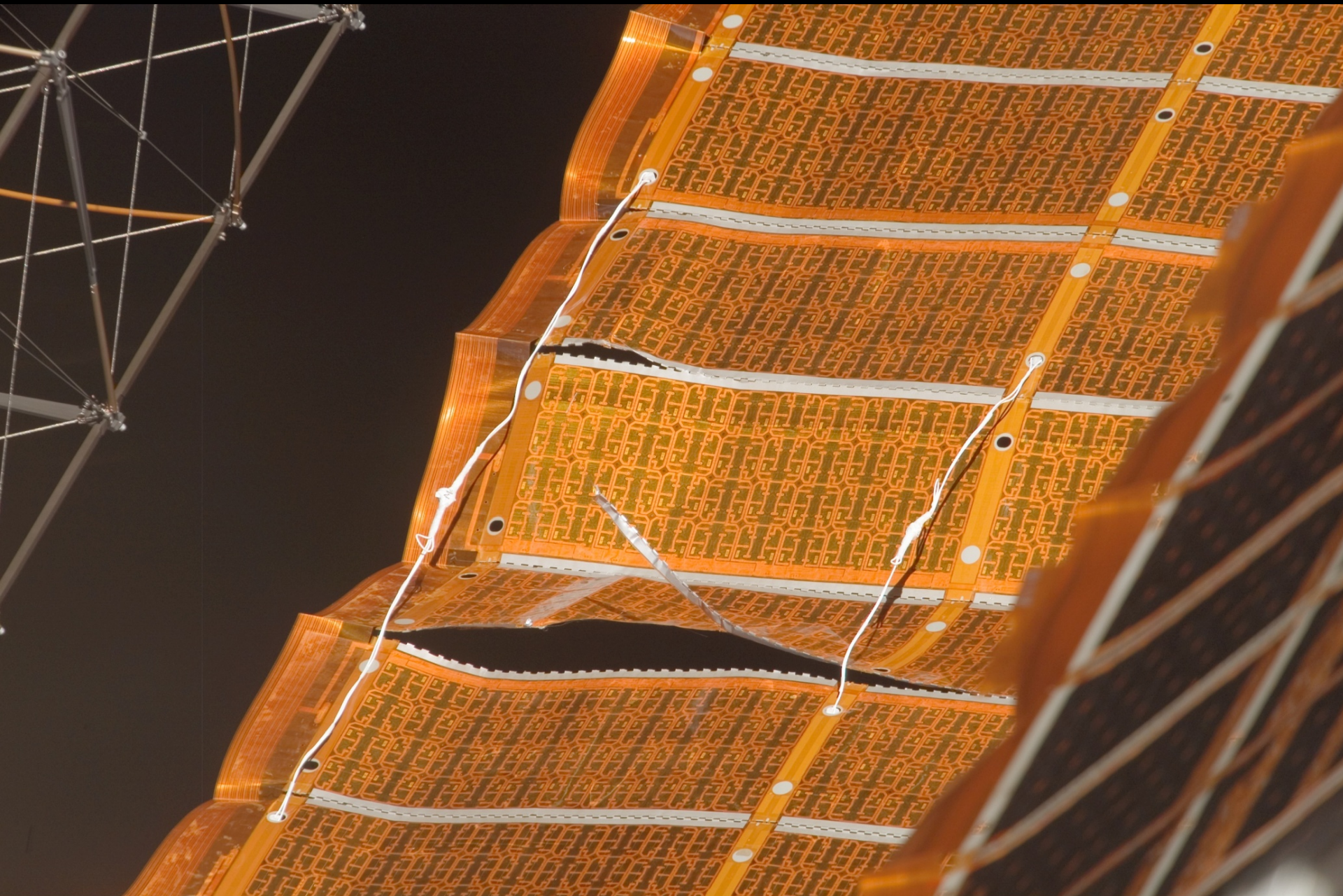
- Wire Cutters

■ Drawer 5:

- Tape Measure
- Steel Rule
- Breaker Bar, 3/8" Drive
- File Set, Small
 - Small Round File
 - Red File Handle
- File Set, Large
 - Large Hand File
 - Black File Handle

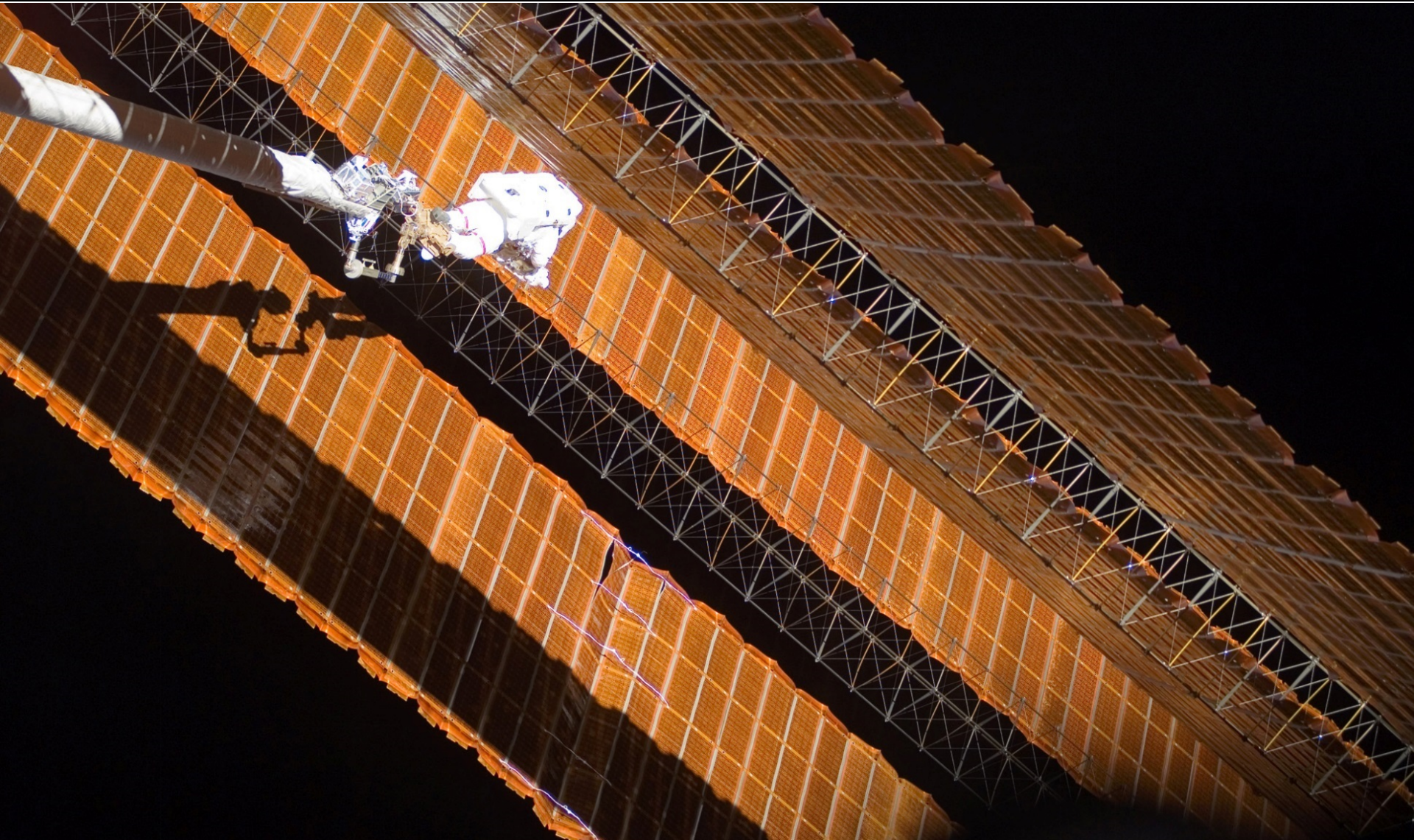
Solar Array Hinge Stabilizers ... a.k.a. Cufflinks





ISS016E008875

Solar Array Seamstress



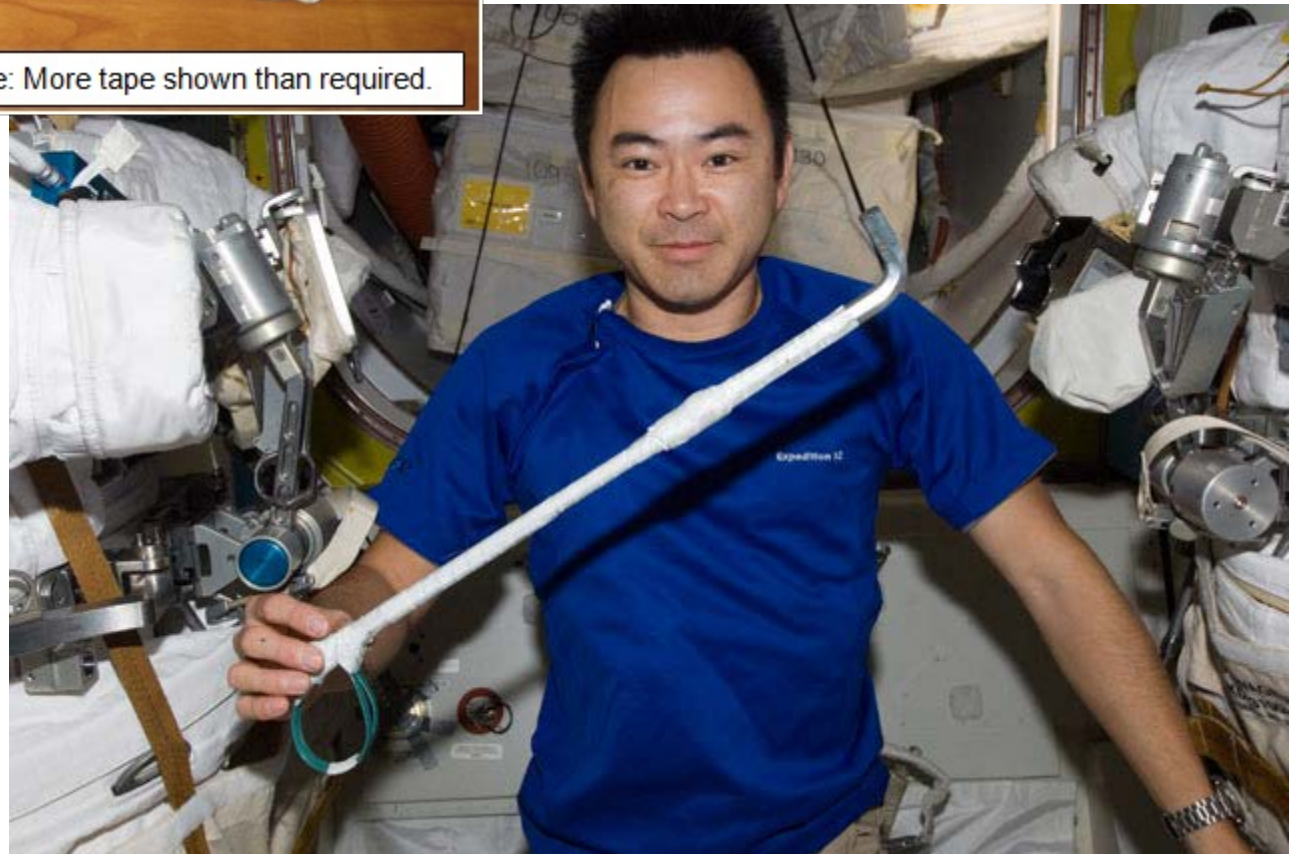
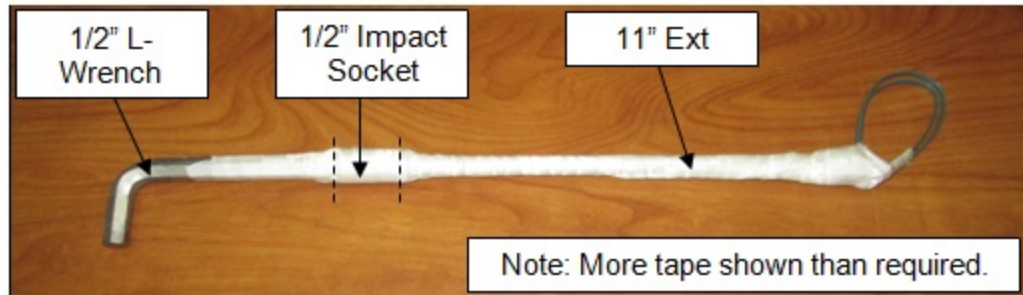
Test Twice, Cut Once (2009/Inc 20)



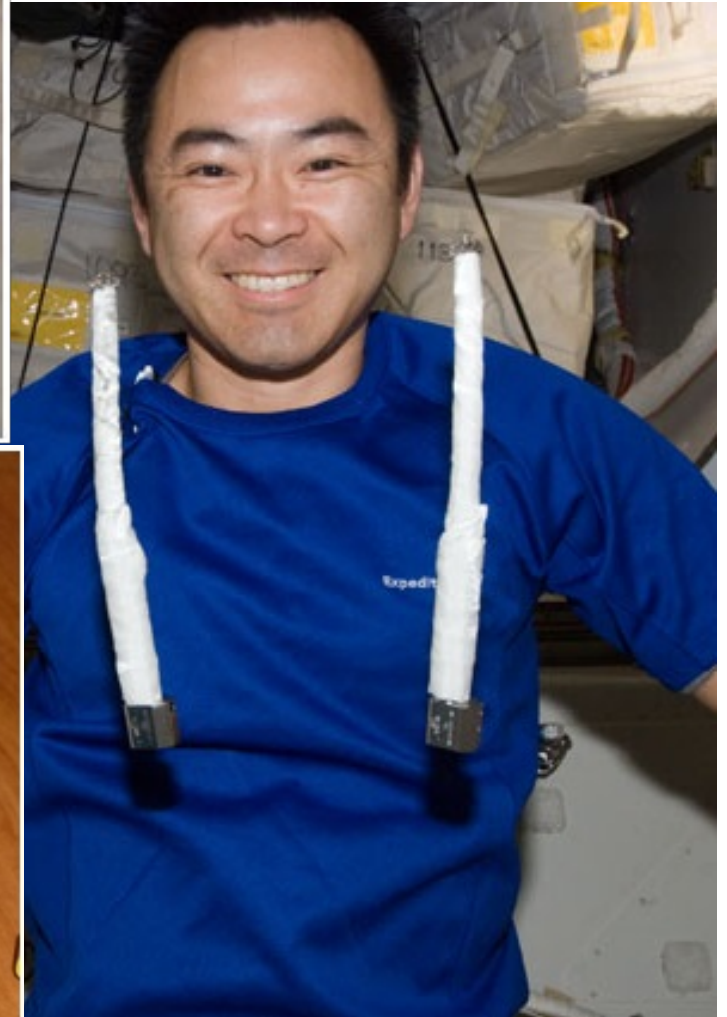
Tethered ACME Bolt



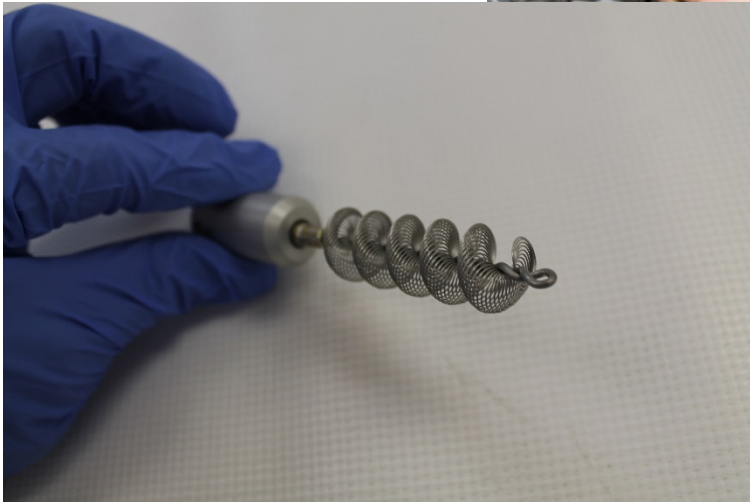
ACME Bolt Interface Tool



Tethered Chimney Sweeps



Tethered Lube (tooth)Brush



Take'm outside



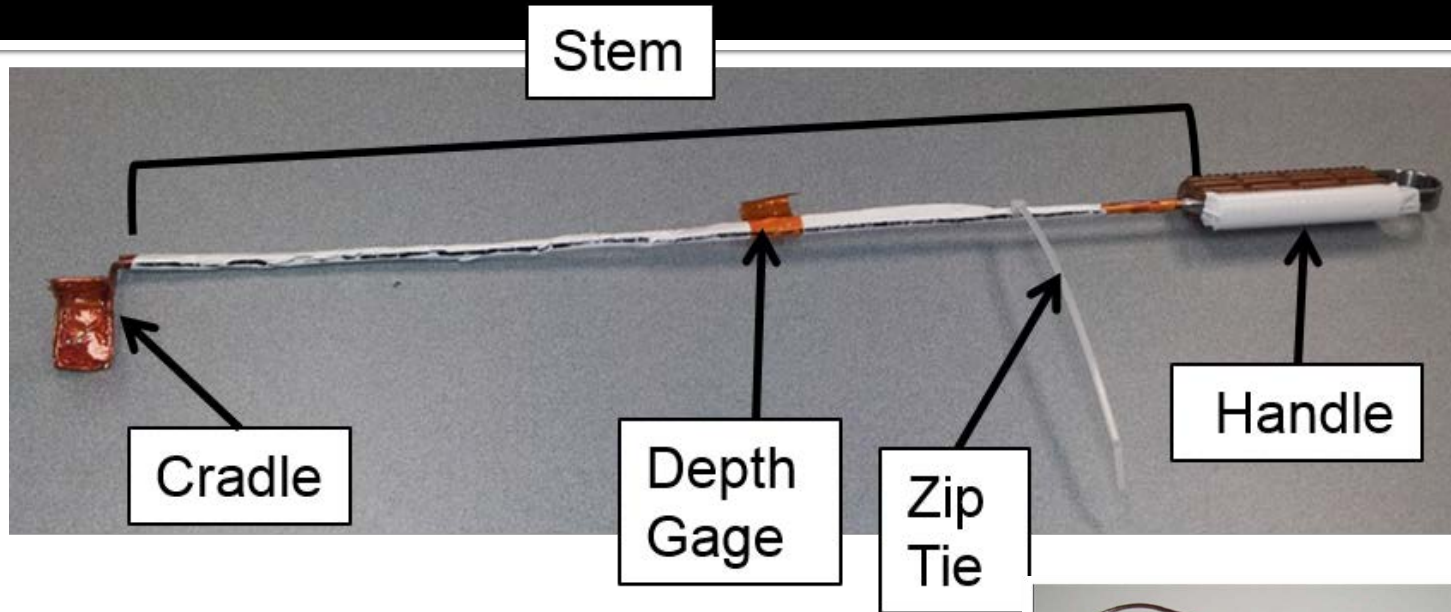
LEE Lube



LEE Lube



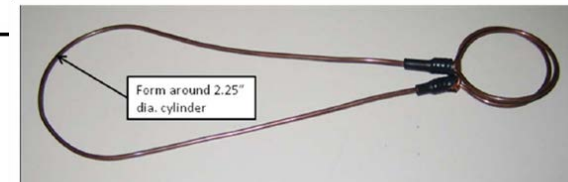
Ballscrew Lubing Tool (BLT)



Space Grease Gun



ISS017E007453



Wire ties

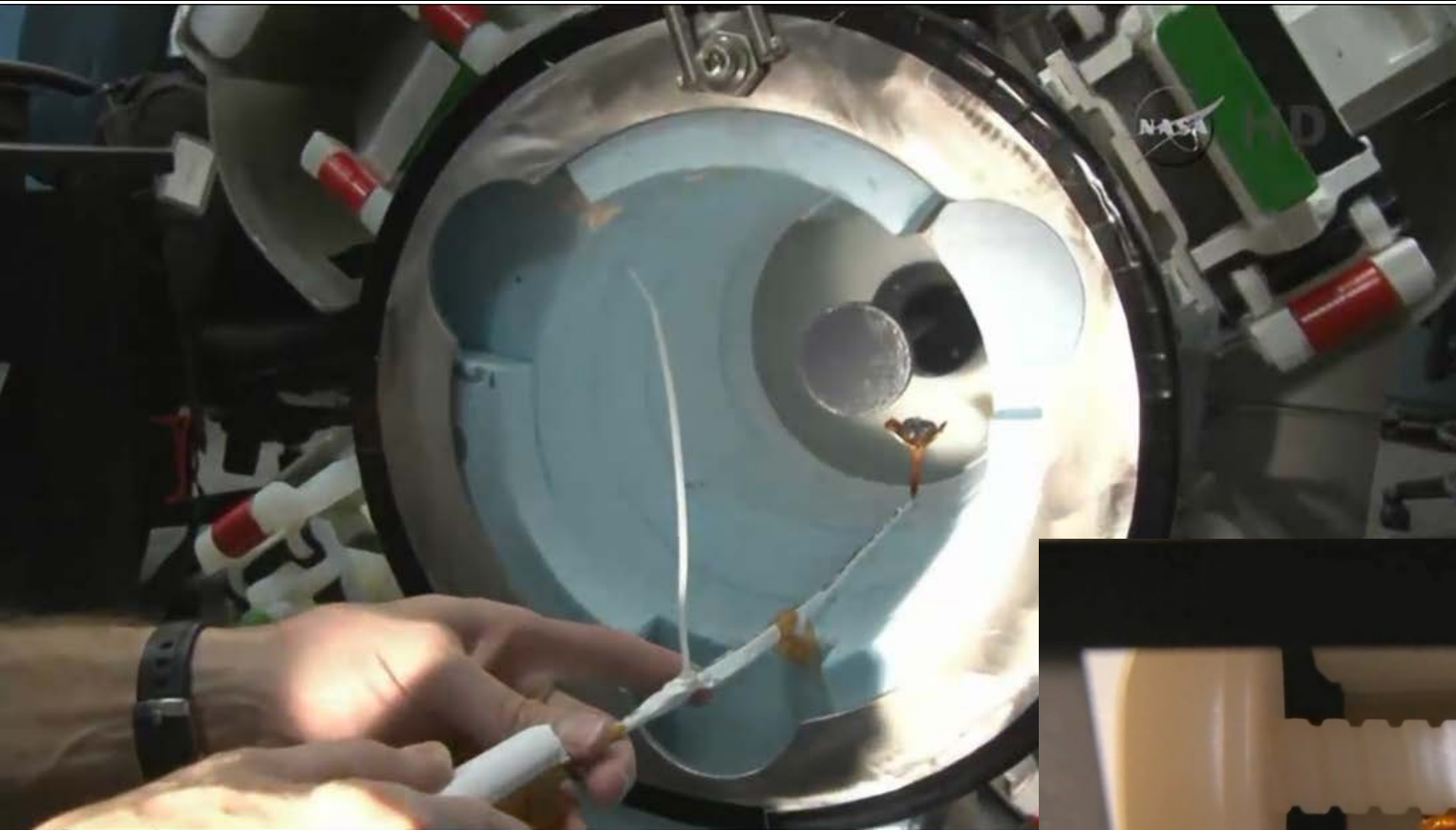


Kapton Tape

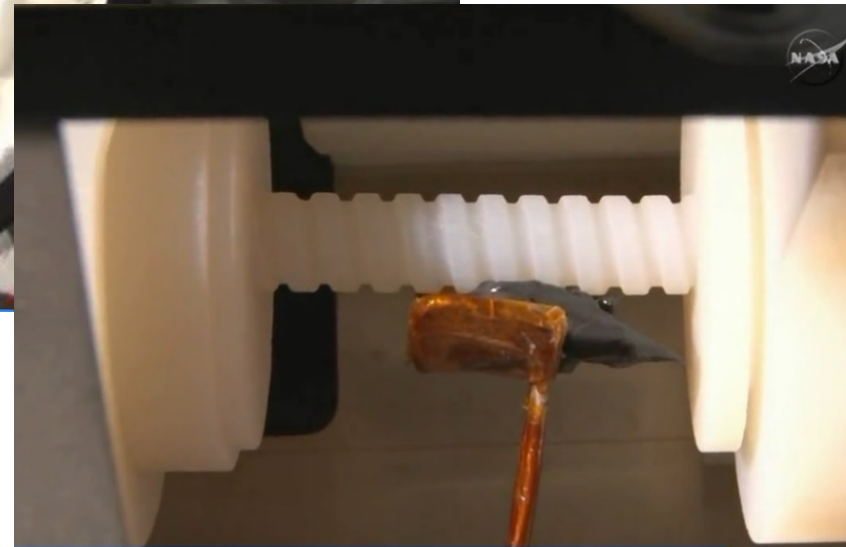


Zip Ties

Ballscrew Lubing Tool (BLT)

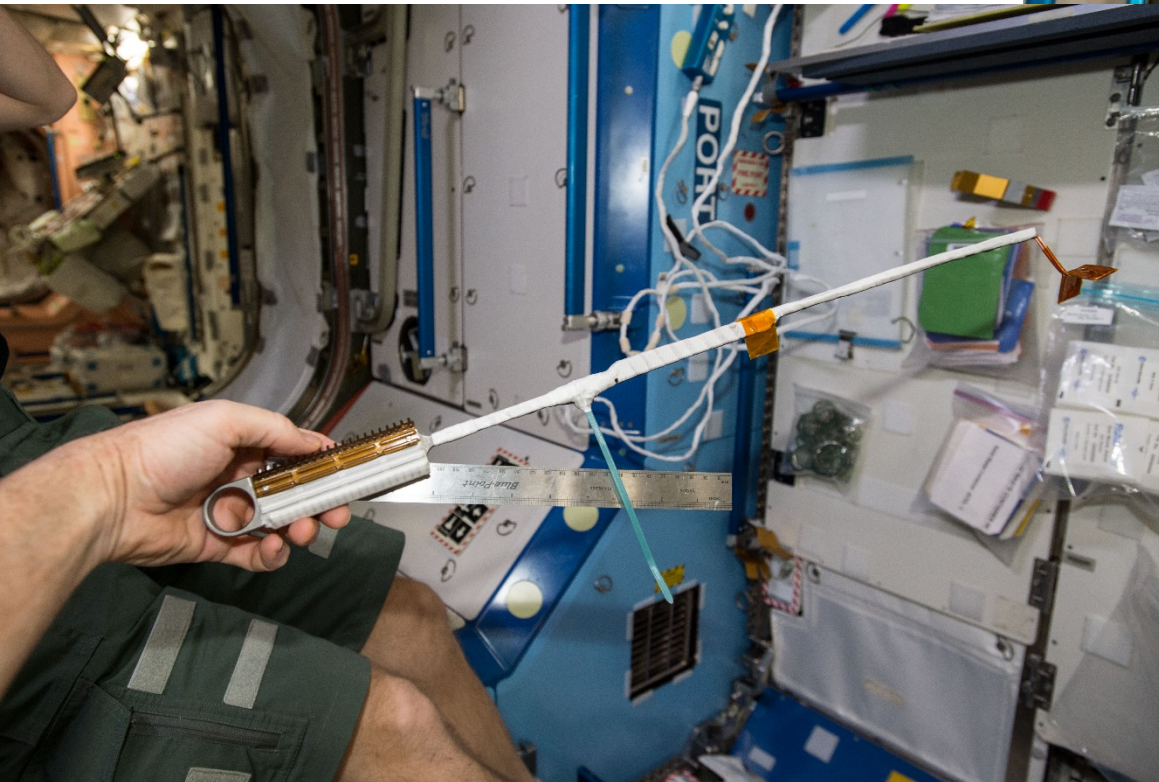


Training to use the BLT on ground mockups of the LEE

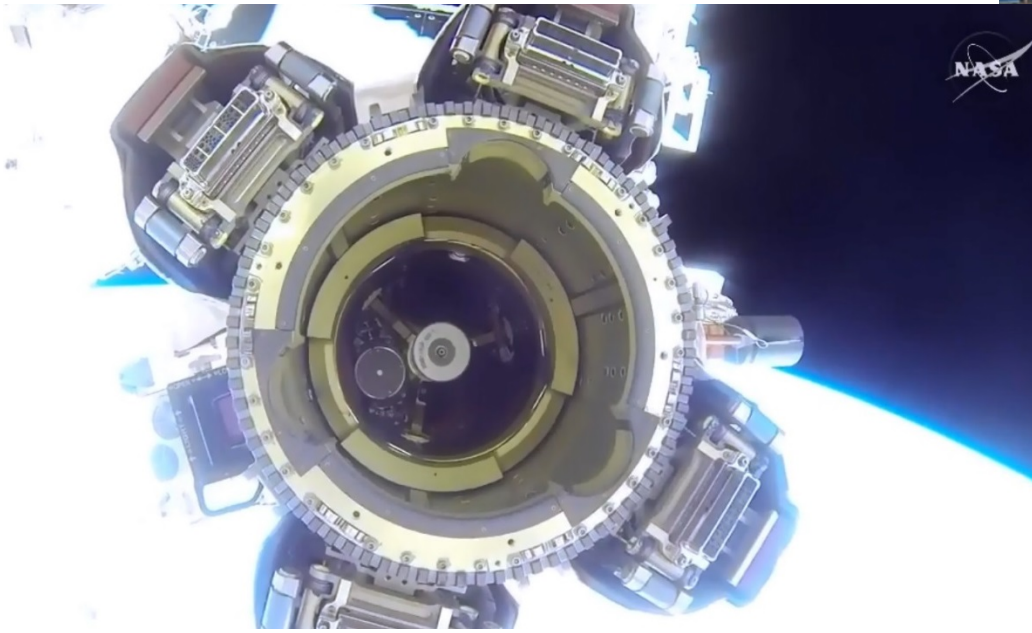


BLT On Orbit

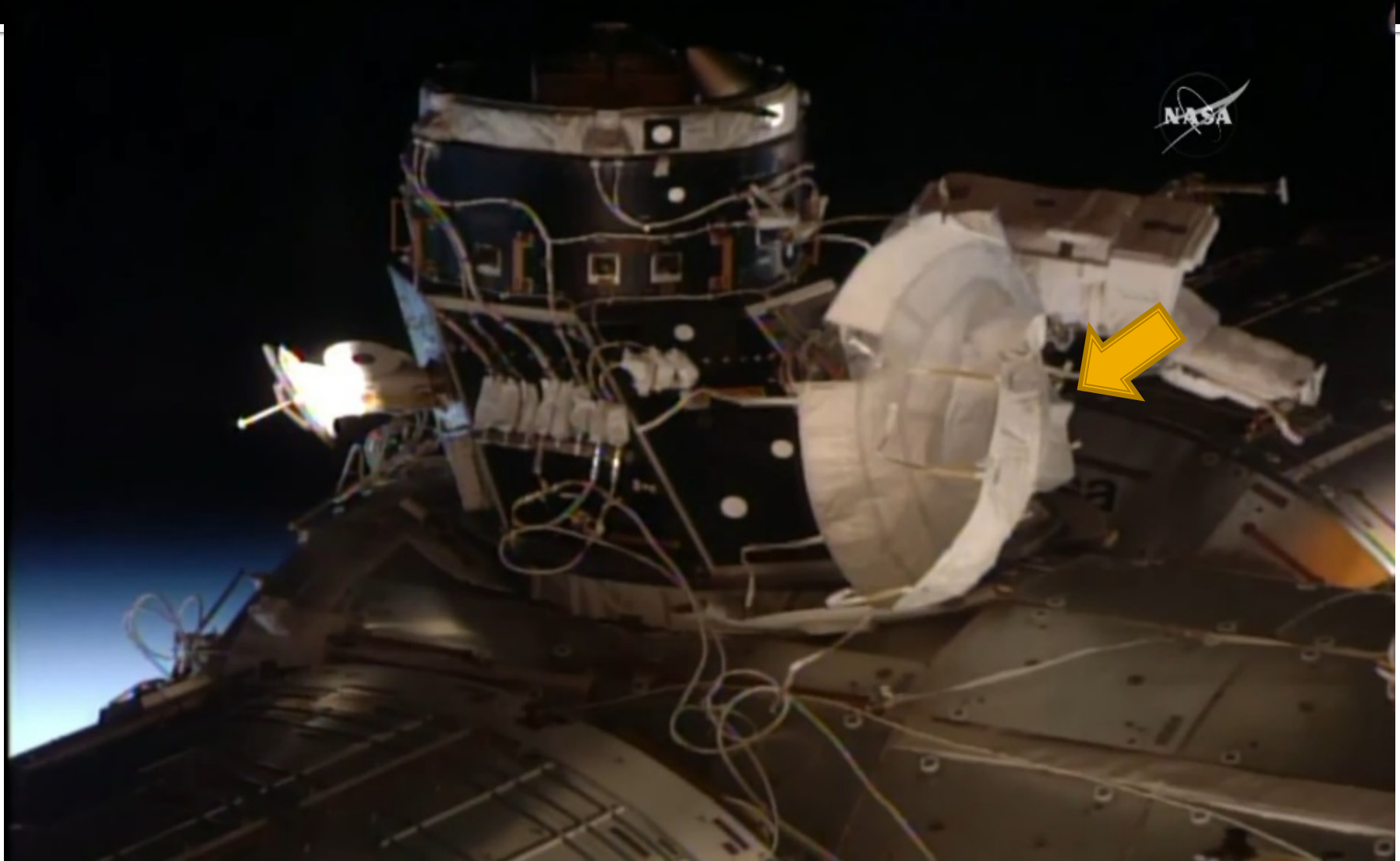
The as built BLT on orbit, looked almost exactly like the ground built unit



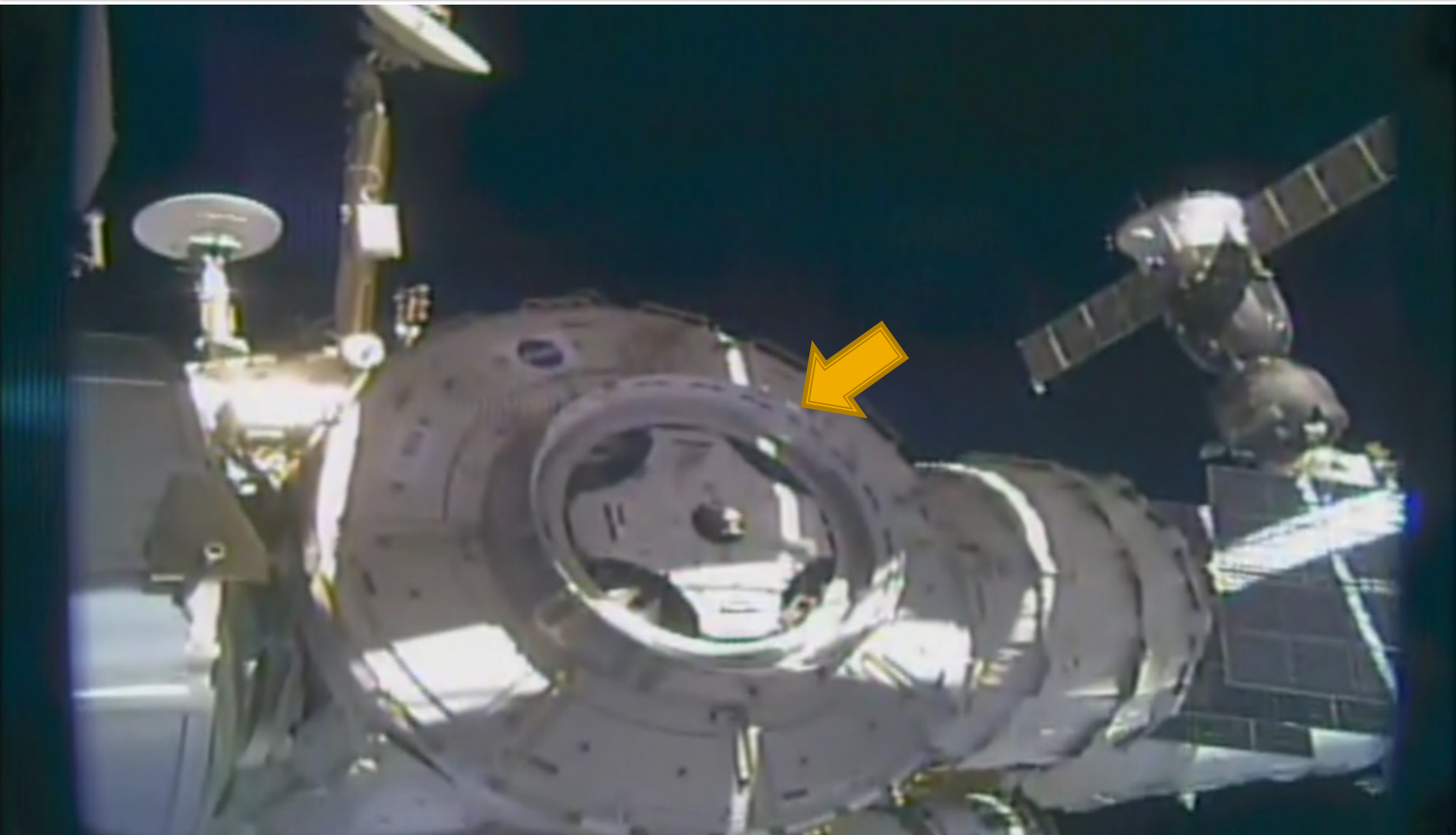
BLT In Use



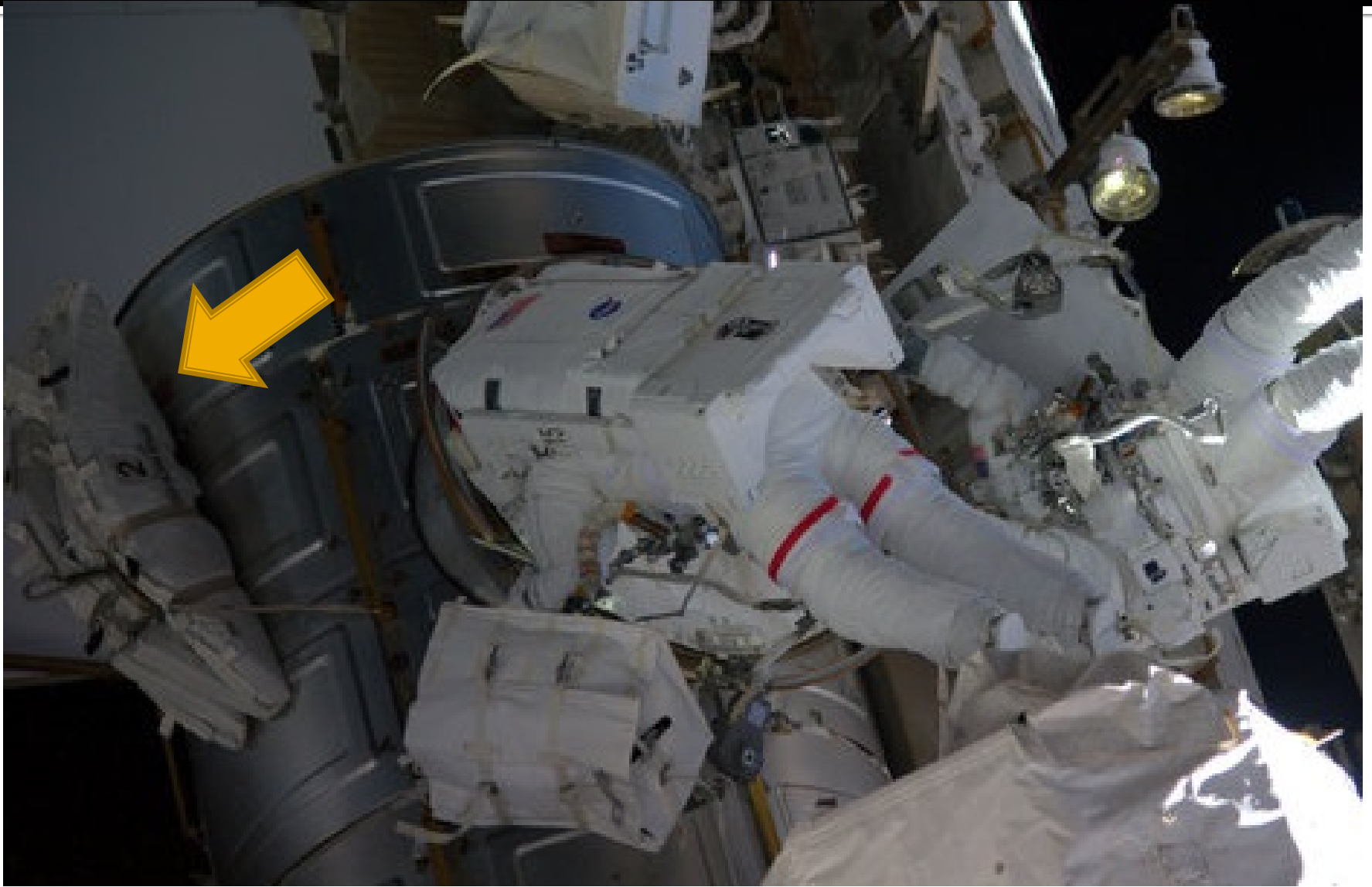
US EVA 41 Lost Shield



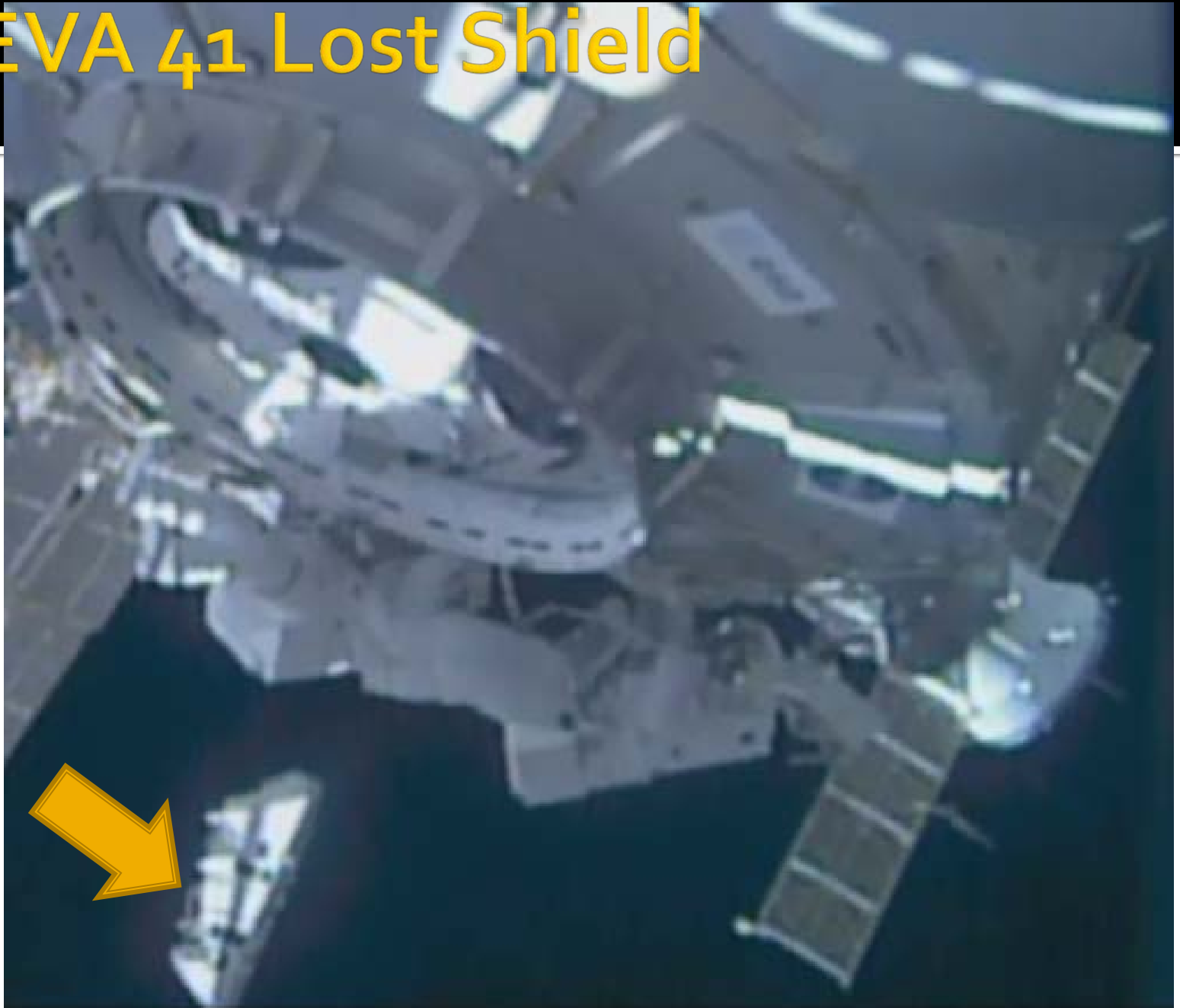
US EVA 41 Lost Shield



US EVA 41 Lost Shield



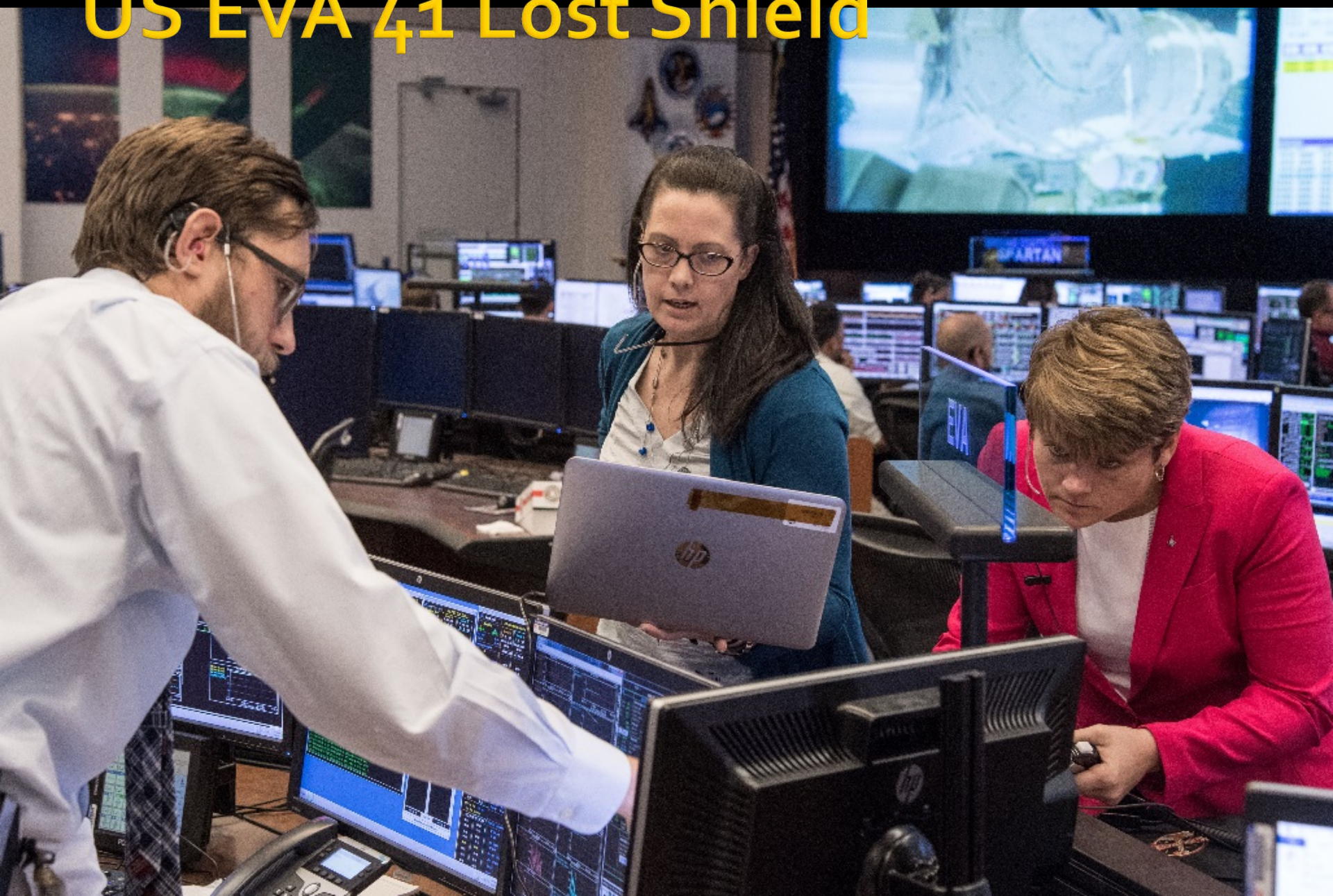
US EVA 41 Lost Shield



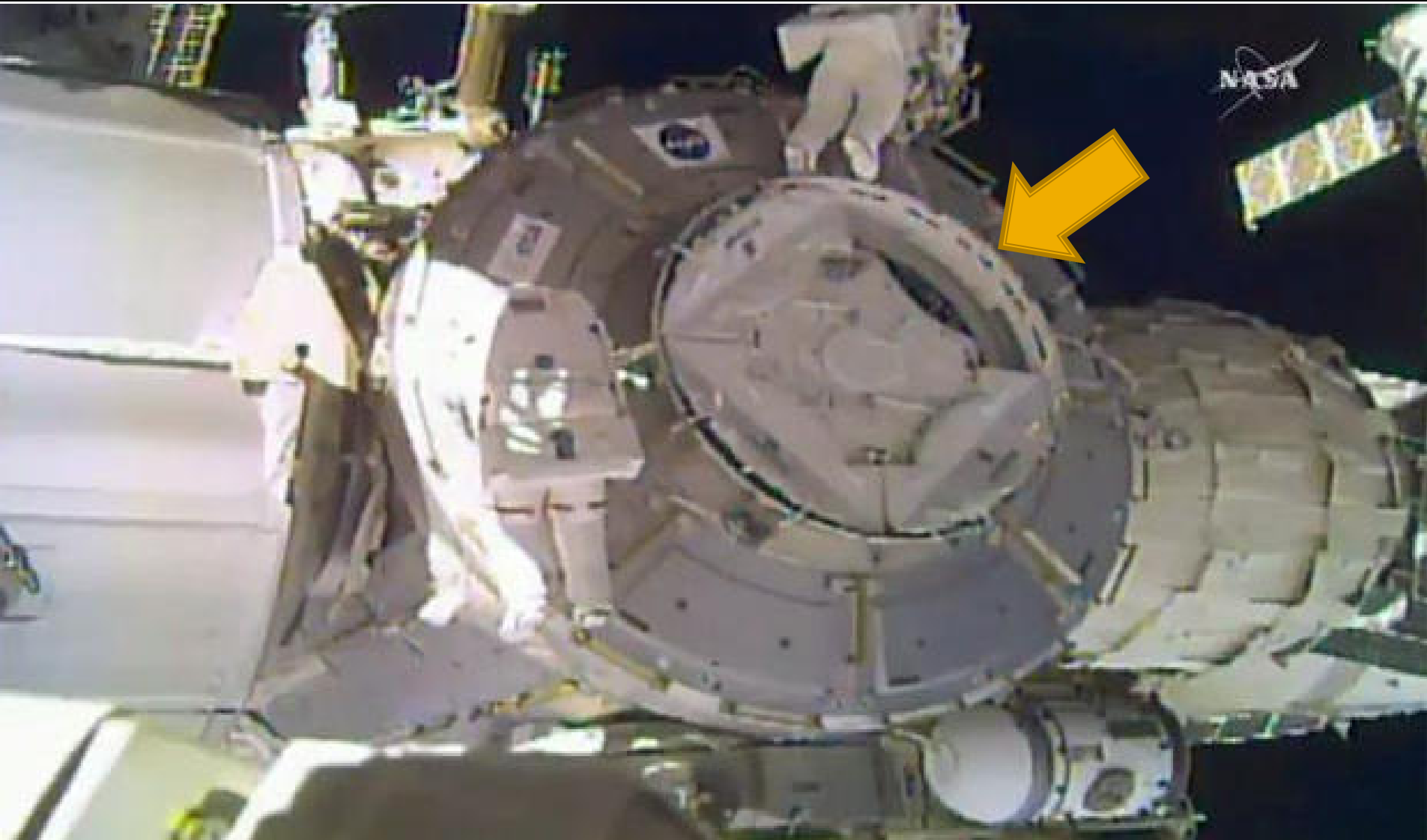
US EVA 41 Lost Shield



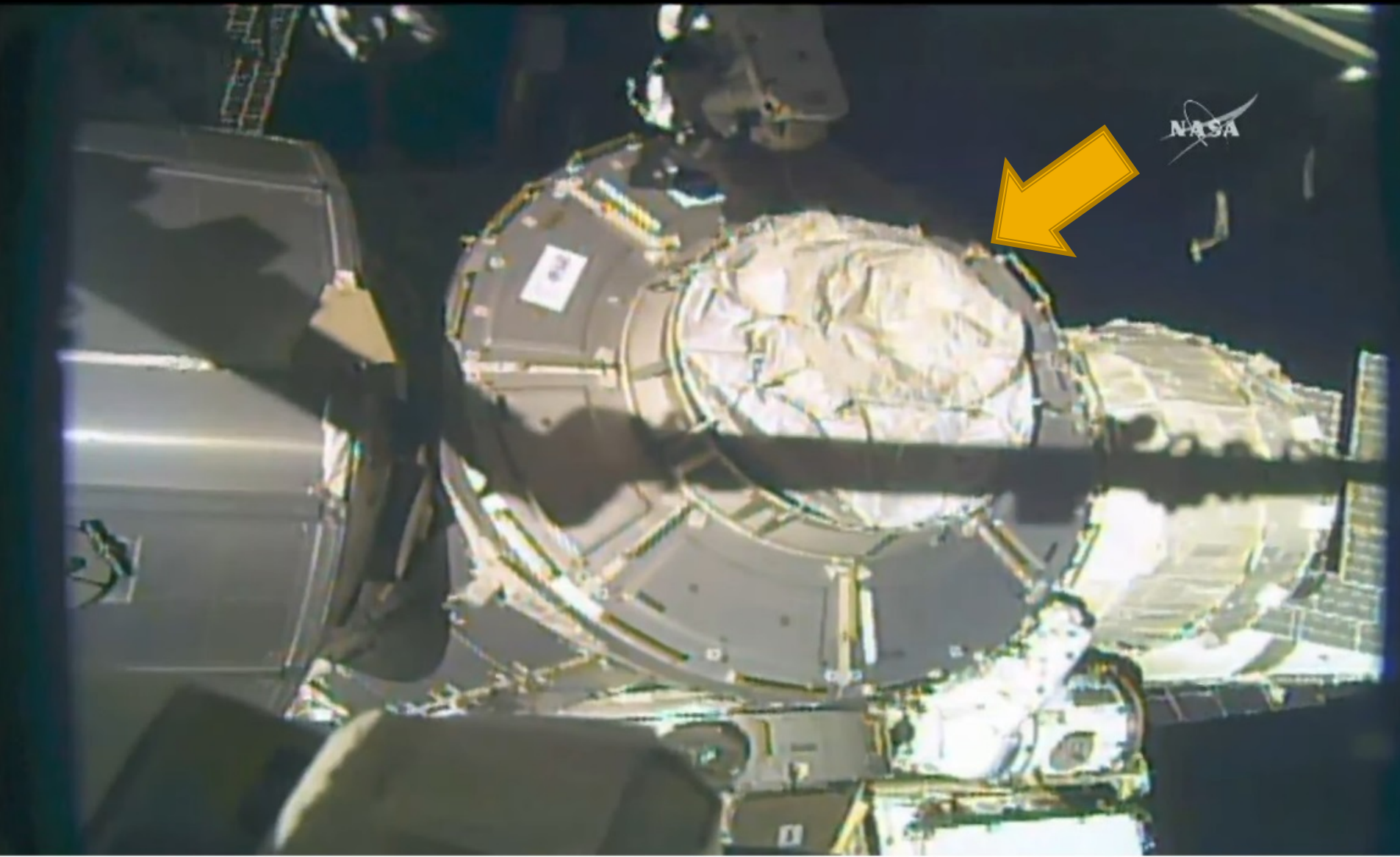
US EVA 41 Lost Shield



US EVA 41 Lost Shield



US EVA 41 Lost Shield



US EVA 41 Lost Shield



News / Nation & World / Science

Spacewalkers lose piece of shielding, use MacGyver-like plan for patch instead



Spacewalking astronauts lost a piece of shielding needed for the International Space Station.

Whitson and Shane Kimbrough were installing the shielding over a vulnerable spot on the space station. (March 30, 2017) (Sign up for our free video newsletter here <http://bit.ly/2n6VKPR>)